CITY OF HOUSTON

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Strategic Purchasing Division

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May 11, 2009

Subject: Letter of Clarification No. 6
Pumps for the Public Works & Engineering Department

Reference: Invitation to Bid (ITB) No.: S12-N23078

To All Prospective Suppliers:

This Letter of Clarification is issued for the following reason:

- Replace Section B, Part II-Specifications with the attached "Revised Section B, Part II – Specifications", dated 05/12/2009.

- To clarify the following:

1. **Question:** Will alternative manufacturer pumps be considered.
   Answer: Yes, alternative manufacturer pumps can be submitted/bid and the pump specification(s) will be reviewed for award consideration.

This Letter of Clarification will be considered part of the solicitation referenced above.

Furthermore, it is the responsibility of each Supplier to obtain any previous Letter(s) of Clarification associated with this solicitation.

Martin L. King
Sr. Staff Analyst
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REVISED SECTION B
PART II - TECHNICAL SPECIFICATIONS
FOR
PUMPS

Dated: May 12, 2009

1.0 **SCOPE:**

The intent of this specification is to provide pumps to the City of Houston. The furnishing and delivery of all pumps specified herein shall be the sole responsibility of the awarded supplier.

1.0.1 If the bidder elects to offer a pump that is not the referenced manufacturer's product, including the serial/model numbers as specified in the electronic bid form and these technical specifications, the bidder "must" provide documentation listing its representative manufacturer's name, product name, product serial/model numbers and detailed product specifications, including applicable warranty information.

1.1 **Pump Types/Sizes:**

1.1.1 Bid Item No. 1
Referenced Manufacturer: Gorman Rupp, Centrifugal Pump (Self Priming), Model No. T8A61S-B, 40HP, 1024 RPM, 1650 GPM @ 53', size: 8" or City approved equal. (2ea.)

1.1.2 Bid Item No. 2
Referenced Manufacturer: Flygt Corpporation, Submersible Pump, Model No. Model No. BS-2670, 27HP, 420 GPM @ 150', Size: 6" or City approved equal.

1.1.3 Bid Item No. 3
Referenced Manufacturer: Flygt Corporation, Submersible Pump, Model No.N-3153, 20HP, 1080 GPM @ 54' Size: 6" or City approved equal. (2ea.)

1.1.4 Bid Item No. 4
Referenced Manufacturer: Flygt Corporation, Submersible Pump, Model No. CP-3127, 7.5 HP, 920 GPM @ 18' TDH, Size: 6" or City approved equal.

1.1.5 Bid Item No. 5
Referenced Manufacturer: Flygt Corporation, Electric Submersible, Model No. CP-3306, 140 HP, 2350 GPM @ 96' TDH, Size: 12" or City approved equal.

1.1.6 Bid Item No. 6
Referenced Manufacturer: Flygt Corporation, Grinder Pump, Model No. MF-3127, 11HP, 480 Volts, 100 GPM @60" TDH (Size: 4") or City approved equal. (8ea.)

1.1.7 Bid Item No. 7
Referenced Manufacturer: KSB, 24" Discharge Electric Submersible, Model No. KRT, 402 HP, 460V, 900 RPM or City approved equal.

1.1.8 Bid Item No. 8
Referenced Manufacturer: KSB, 20" Discharge Electric Submersible, Model No. KRT, 250 HP, 460V, 13,000 RPM or City approved equal.

1.1.4 Bid Item No. 9
Referenced Manufacturer: Fairbanks Morse, Submersible Pump, Model No. DJ5731MV, 14", 95 Hp, 900 RPM or City approved equal.

1.1.5 Bid Item No. 10
Referenced Manufacturer: Fairbanks Morse, Submersible Pump, Model No. 5415, 10", 75 Hp, 900 RPM, 3,000 GPM @ 55' TDH or City approved equal.

1.1.6 Bid Item No. 11
Referenced Manufacturer: Periflo Peristaltic Pump for lime slurry, or City approved equal.

1.1.7 Bid Item No. 12
Referenced Manufacturer: Peristaltic Pump for powdered activated carbon slurry, or City approved equal.

1.1.8 Bid Item No. 13

Referenced Manufacturer: Fibroc Pump, Series 1500, Size 3x4x10, 7.5 HP City approved equal.

2.0 **DELIVERY**:

The supplier agrees to make deliveries only upon notification by a designated City of Houston representative and only after it is in receipt of duly signed and approved Purchase Order(s) issued by the City of Houston Purchasing Agent or designee. Deliveries made without such Purchase Order and notification shall be at Bidder's risk and shall leave the City the option of canceling any agreement implied or expressed herein.

2.1 The supplier shall deliver the pumps in the specified sizes and quantities "only" after it is notified to do so by a designated City of Houston representative. The supplier shall be required to delivery the pumps specified in the purchase order(s) within sixty (60) calendar days after receipt of the City of Houston Purchase Order.

2.2 All individual deliveries received by the City are subject to testing to determine if the items meet specifications. Items/Pumps that fail to meet specifications shall be rejected.

3.0 ITEM NO. 1: 8" SELF PRIMING CENTRIFUGAL PUMP,
Furnish 2 ea. submersible non-clog wastewater pumps.

3.0.1 Gorman Rupp Model No. T8A61S-B, 8" X 8"
3.0.2 40HP
3.0.3 1024 RPM
3.0.4 Operating Point: 1650 GPM @ 53'
3.0.5 Casing shall be Gray Iron 30
3.0.6 Impeller: Two Vane Vortex, SSTL 316
3.0.7 Replaceable Wear Plate: SSTL 316
3.0.8 Removable Adjustable Cover Plate: Gray Iron 30; 94 lbs.
3.0.9 Flap Valve: Neoprene w/Nylon and Steel Reinforcing
3.0.10 Seal Plate: SSTL 316
3.0.11 Bearing Housing: Gray Iron 30
3.0.12 Radial and Thrust Bearings: Open Double Row Ball
3.0.13 Bearing and Seal Cavity Lubrication: SAE 30 Non-Detergent Oil
3.0.14 Flanges: #125 Gray Iron 30
3.0.15 Gaskets: Buna-N, Compressed Synthetic Fibers, PTFE, Cork, and Rubber
3.0.16 O-Rings: Buna-N
3.0.17 Internal Wetted Hardware: SSTL 316
3.0.18 External Hardware: Standard plated steel
3.0.19 Pressure Relief Valve: SSTL 316
3.0.20 Bearing and Seal Cavity oil level sight gauges;
3.0.21 Steel base with pump and motor attached
3.0.22 Metal Bellows Seal
3.0.23 Automatic air release valve
3.0.24 Pulley and belt drive

3.5 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The supplier shall conduct warranty work within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

3.6 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

3.7 DELIVERY:
Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 100 calendar days after receipt of a City of Houston Purchase Order.

3.8 TRAINING:
A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

4.0 ITEM NO. 2: 6" ELECTRIC SUBMERSIBLE PUMP, FLYGT CORPORATION MODEL NO. BS-2670,20HP:
Furnish one 6" submersible non-clog de-watering pump.

4.0.1 Model No. BS_2670
4.0.2 60Hz
4.0.3 Impeller: High chrome alloyed white cast iron
4.0.4 Operating Point: max +40°C
4.0.5 Wear Parts: Nitrile rubber, high chrome cast iron
4.0.6 Stator Housing: Cast iron
4.0.7 Strainer: SSTL
4.0.8 Shaft: SSTL
4.0.9 Flow capacity rating shall be 420 gpm or greater
4.0.10 Discharge head rating of 128 ft.
4.0.11 Pump shall be three phase 460 Volt unit
4.0.12 Top discharge size 4" diameter with NPT connection
4.0.13 Pump shall have strainer covering on intake
4.0.14 Motor shall be equipped with overload protection
4.0.15 On/Off control
4.0.16 Cable connection: At least 50'
4.0.17 50' shut off head
4.0.18 NEMA premium motor or equivalent
4.0.19 Top sprayed with grey pain
4.0.20 Requires an anode (Note: Anode is not to be painted but bonded to bear metal)
4.0.21 All wetted parts are to be painted with a chemical resistant epoxy
4.0.22 O-rings shall be of Viton
4.0.23 Seals shall be chemical resistant silicon carbide

4.12 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

4.13 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

4.14 DELIVERY:
Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 100 calendar days after receipt of a City of Houston Purchase Order.

4.15 TRAINING:
A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

SECTION B PART II TECHNICAL SPECIFICATIONS FOR PUMPS CONT'D.

5.0 ITEM NO. 3: 6" ELECTRIC SUBMERSIBLE PUMP FLYGT CORPORATION MODEL NO. FLYGHT N-3153, 20HP:

5.1 Furnish two 6", submersible non-clog wastewater pump.

5.1.1 Each pump shall be equipped with a 20 HP submersible electric motor, connected for operation on 230 and 460 volts, 3 phase, 60 hertz, 4 wire service, with 50 feet of submersible cable suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pump shall be capable of operating with existing 8 inch Flygt Corporation discharge connection with no modification or extra cost to the City. The pump shall be supplied with a drilled flanges and a stand for portable use. The pump shall be capable of delivering the design condition of 1080 GPM at 54 TDH. The pump shall operate at the design condition with an efficiency of 81.4 %. The pump shall also be able to operate 1880 GPM at 25 feet total head with out vibration or cavitations. Shut off head shall be 94 feet (minimum).

5.1.2 The pump must be able to be installed in dry pit application with no modification and be rated for continuous duty in a completely dry environment.

5.2 PUMP DESIGN

The pumps shall be capable of being used in a portable configuration or with a Flygt guide rail configuration with existing discharge connections. Pump is to be installed vertically.

5.3 PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

5.3.1 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

5.3.2 Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

5.4 COOLING SYSTEM

Each unit shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid trough the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F. (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

5.5 MOTOR

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

5.5.1 The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

5.5.2 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

5.5.3 Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

5.6 BEARINGS

The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

5.7 MECHANICAL SEALS

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

5.7.1 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

5.7.2 The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

5.7.3 A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

5.8 PUMP SHAFT

The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be AISI type 431 stainless-steel. Shaft sleeves will not be acceptable.

5.9 IMPELLER

The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

5.10 VOLUTE/SUCTION COVER

The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

5.11 PROTECTION

Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

5.11.1 The thermal switches and float switch shall be connected to the existing Mini CAS control and status monitoring unit. If pumps are supplied that will not operate with the existing monitoring unit, the pump supplier shall have an electrician approved by the City of Houston with the proper insurance and licenses, install the proper monitoring units at no cost to the City.

5.12 WARRANTY:

The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

5.13 LITERATURE:

The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

5.14 DELIVERY:

Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 100 calendar days after receipt of a City of Houston Purchase Order.

5.15 TRAINING:

A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

6.0 ITEM NO. 4: 6" FLYGT ELECTRIC SUBMERSIBLE MODEL NO. FLYGT CP-3127, 7.5HP
Furnish one 6" submersible non-clog wastewater pumps.

6.0 Each pump shall be equipped with a 7.5 HP submersible explosion-proof electric motor, connected for operation on 230 volts, 3 phase, 60 hertz, 4 wire service, with 40 feet of submersible cable suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. 1637 GPM at 5 TDH. An additional point on the same curve shall be 7500 GPM at 5 TDH, Shutoff shall be 34 feet minimum. The motor shall be capable of operating 230 to 460 volts giving the City the ability to move the pump from location to location

6.1 The pump must be able to be installed in dry pit application with no modification and be rated for continuous duty in a completely dry environment.

6.2 PUMP DESIGN
The pumps shall be capable of being used in a portable configuration or with a Flygt guide rail configuration with existing discharge connections.

6.3 PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

6.3.1 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

6.3.2 Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

6.4 COOLING SYSTEM
Each unit shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid trough the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F. (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

6.5 MOTOR

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

6.5.1 The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

6.5.2 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

6.5.3 Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

6.6 BEARINGS

The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

6.7 MECHANICAL SEALS

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

6.7.1 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

6.7.2 The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

6.7.3 A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

6.8 PUMP SHAFT

The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be AISI type 431 stainless-steel. Shaft sleeves will not be acceptable.

6.9 IMPELLER

The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

6.10 VOLUTE/SUCTION COVER

The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

6.11 PROTECTION

Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

6.11.1 The thermal switches and float switch shall be connected to the existing Mini CAS control and status monitoring unit. If pumps are supplied that will not operate with the existing monitoring unit, the pump supplier shall have an electrician approved by the City of Houston with the proper insurance and licenses, install the proper monitoring units at no cost to the City.

6.12 WARRANTY:

The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

6.13 LITERATURE:

The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

6.14 DELIVERY:

Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 100 calendar days after receipt of a City of Houston Purchase Order.

6.15 TRAINING:

A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

7.0 ITEM NO. 5: 12" FLYGT ELECTRIC SUBMERSIBLE MODEL NO. FLYGT CP-3306, 140HP
Furnish one 12" submersible non-clog wastewater pumps.

7.1 Each pump shall be equipped with a 140 HP submersible explosion-proof electric motor, connected for operation on 460 volts, 3 phase, 60 hertz, 4 wire service, with 90 feet of submersible cable suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. Also, 90 linear feet of muti-conductor submersible cable will be used to convey pump monitoring signals. 2350 GPM at 96 TDH. An additional point on the same curve shall be 7500 GPM at 40 TDH, Shutoff shall be 120 feet minimum.

7.2 The pump must be able to be installed in dry pit application with no modification and be rated for continuous duty in a completely dry environment. Pump will be installed in a wet well, but may be relocated into a dry pit later.

7.3 PUMP DESIGN
The pumps shall be capable of being used in a portable configuration or with a Flygt guide rail configuration with existing discharge connections.

7.4 PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

7.4.1 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

7.4.2 Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

7.5 COOLING SYSTEM
Each unit shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid trough the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F. (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

7.6 MOTOR

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

7.6.1 The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

7.6.2 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

7.6.3 Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

7.7 BEARINGS

The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

7.8 MECHANICAL SEALS

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

7.8.1 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

7.8.2 The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

7.8.3 A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

7.9 PUMP SHAFT

The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be AISI type 431 stainless-steel. Shaft sleeves will not be acceptable.

7.10 IMPELLER

The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

7.11 VOLUTE/SUCTION COVER

The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

7.12 PROTECTION

Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

7.12.1 The thermal switches and float switch shall be connected to the existing Mini CAS control and status monitoring unit. If pumps are supplied that will not operate with the existing monitoring unit, the pump supplier shall have an electrician approved by the City of Houston with the proper insurance and licenses, install the proper monitoring units at no cost to the City.

7.13 WARRANTY:

The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

7.14 LITERATURE:

The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

7.15 DELIVERY:

Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 240 calendar days after receipt of a City of Houston Purchase Order.

7.16 TRAINING:

A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

8.0 ITEM NO. 6: PUMP, SUBMERSIBLE - 2" FLYGT MODEL NO. MF-3127 GRINDER PUMP
Furnish eight submersible pumps.

8.1 GENERAL:
- 8.1.1 Flygt MF_3127 – recommended unit(s)
- 8.1.2 Submersible grinder pump
- 8.1.3 Pump shall be heavy duty free standing submersible non-clog rated for wastewater applications

8.2 PUMP:
- 8.2.1 Flow capacity rating shall be 100 gpm or greater
- 8.2.2 With discharge head rating of 60 ft.
- 8.2.3 Pump shall be three phase 480 Volt unit at 13 amps
- 8.2.4 Top discharge size 2" diameter with NPT connection
- 8.2.5 Stator windings shall be insulated with moisture resistant Class H insulation for 108° C
- 8.2.6 Shaft shall be constructed of Stainless Steel
- 8.2.7 Motor shall be equipped with overload protection
- 8.2.8 Motor shall be able to operate dry without damage
- 8.2.9 Control shall be on/off
- 8.2.10 Cable connection shall be 50' nominal length or greater

8.3 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

8.4 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

8.5 DELIVERY:
Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 100 calendar days after receipt of a City of Houston Purchase Order.

8.6 TRAINING:
A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

9.0 ITEM NO. 7: PUMP, SUBMERSIBLE - 24" KSB MODEL NO. KRT
Furnish one submersible pump.

9.1 GENERAL:

9.1.1 KSB_KRT – recommended unit(s)
9.1.2 Discharge electric submersible pump
9.1.3 Pump shall be heavy duty free standing submersible non-clog rated for wastewater applications

9.2 PUMP:

9.2.1 Minimum Shutoff head:106 FT
9.2.2 Maximum Motor HP: 402 HP
9.2.3 Voltage: 4160V
9.2.4 Motor RPM: 900 RPM
9.2.5 Minimum Shutoff head:106 FT
9.2.6 Maximum Motor HP: 402 HP
9.2.7 Voltage: 4160V
9.2.8 Minimum Hydraulic Efficiency (at design): 71%
9.2.9 Motor RPM: 900 RPM
9.2.10 Provide 98 ft of power/control cable

9.3 **QUALITY ASSURANCE - REFERENCED STANDARDS:**
American Iron & Steel Institute (AISI)
American Society for Testing and Materials (ASTM)
Factory Mutual (FM)
Hydraulic Institute Standards for Centrifugal, Rotary, and Recip Pumps (HI)
National Fire Protection Agency (NFPA)
National Electric Code(NEC)
National Electrical Manufacturers Association(NEMA)
Anti-Friction Bearing Manufacturers Association(AFBMA)
International Standards Organization (ISO) - ISO9001

9.4 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

9.5 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

9.6 DELIVERY:
Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 240 calendar days after receipt of a City of Houston Purchase Order.

9.7 TRAINING:
A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

10.0 ITEM NO. 8: PUMP, SUBMERSIBLE - 20" KSB MODEL NO. KRT
Furnish one submersible pump.

10.1 GENERAL:
10.1.1 KSB_KRT – recommended unit(s)
10.1.2 Discharge electric submersible pump
10.1.3 Pump shall be heavy duty free standing submersible non-clog rated for wastewater applications.

10.2 Operating Conditions: **13,000GPM @ 50 FT TDH**
10.3 Minimum Shutoff head:106 FT
10.4 Maximum Motor HP: **250** HP
10.5 Voltage: **460V**
10.6 Motor RPM: 900 RPM
10.7 Operating Conditions: **13,000GPM @ 50 FT TDH**
10.8 Minimum Shutoff head:106 FT
10.9 Maximum Motor HP: **250** HP
10.10 Voltage: **460V**
10.11 Minimum Hydraulic Efficiency (at design): **81%**
10.12 Motor RPM: 900 RPM
10.13 Provide 85 ft of power/control cable

10.14 **QUALITY ASSURANCE - REFERENCED STANDARDS:**
American Iron & Steel Institute (AISI)
American Society for Testing and Materials (ASTM)
Factory Mutual (FM)
Hydraulic Institute Standards for Centrifugal, Rotary, and Recip Pumps (HI)
National Fire Protection Agency (NFPA)
National Electric Code(NEC)
National Electrical Manufacturers Association(NEMA)
Anti-Friction Bearing Manufacturers Association(AFBMA)
International Standards Organization (ISO) - ISO9001

10.15 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

10.16 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

10.17 DELIVERY:
Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 240 calendar days after receipt of a City of Houston Purchase Order.

10.18 TRAINING:
A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

11.0 ITEM NO. 9: PUMP, SUBMERSIBLE - 14" FAIRBANKS MORSE MODEL DJ5731MV
Furnish one submersible pump.

11.1 GENERAL:
- 11.1.2 Fairbanks Mose Model DJ5731MV– recommended unit(s)
- 11.1.3 Submersible non-clog sewage pump
- 11.1.4 Pump shall be furnished with corrosion protection i.e. attached zinc anodes

11.2 PUMP:
- 11.2.1 100HP, UL listed 900 RPM submersible motor, rated at 95 HP for continuous air operation
- 11.2.2 70 ft. of power and control cables
- 11.2.3 300-350 BHN impeller and volute wear rings
- 11.2.4 SSTL Impeller hardware
- 11.2.5 Cooling Jacket
- 11.2.6 Tnemec coating on exterior of pump
- 11.2.7 Meet vertical, single stage, non-clog centrifugal pump standards
- 11.2.8 5100 gpm at 40 TDH

11.3 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

11.4 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

11.5 DELIVERY:
Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 240 calendar days after receipt of a City of Houston Purchase Order.

11.6 TRAINING:
A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

12.0 ITEM NO. 10: PUMP, SUBMERSIBLE - 10" X 10" FAIRBANKS MORSE MODEL 5415

12.1 GENERAL:

12.1.1 Fairbanks Mose Model 5415, 10" X 10", CCS rotation, S/N K2S1-0644867– recommended unit(s)
12.1.2 Dry pit pump
12.1.3 Pump shall be furnished with corrosion protection i.e. attached zinc anodes

12.2 PUMP:

12.2.1 75HP, UL listed 705 RPM
12.2.2 70 ft. of power and control cables
12.2.3 3,000 GPM @ 55 TDH
12.2.4 SSTL Impeller hardware
12.2.5 Cooling Jacket
12.2.6 Tnemec coating on exterior of pump
12.2.7 Meet vertical, single stage, non-clog centrifugal pump standards

12.3 WARRANTY:

The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

12.4 LITERATURE:

The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

12.5 DELIVERY:

Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than 100 calendar days after receipt of a City of Houston Purchase Order.

12.6 TRAINING:

A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

13.0 ITEM NO. 11: PUMP, PERISTALTIC PUMPS - PERIFLO MODEL FMP

13.1 PUMP MODEL

Pump shall be PERIFLO MODEL FMP

13.2 OPERATING CONDITIONS

Lime slurry.

13.3 Pump Construction:

13.3.1 Horizontal, positive displacement, peristaltic pump
13.3.2 Capable of operating in either direction without flow variation
13.3.3 Capable of running dry without damage to pump or hose
13.3.4 Capable of pulling 95% of full vacuum
13.3.5 Repeatability: 1% accurate
13.3.6 Valveless/Glandless with no dynamic seals in contact with the pumped product
13.3.7 Simplex or duplex as indicated in the Process Pump Schedule
13.3.8 Pump will be capable of being rotated in 90-degree increments for four (4) different port mounting configurations
13.3.9 Direct coupled gear arrangement. Pumps with close coupled or bare shaft arrangements are not acceptable
13.3.10 Angle of hose 180 degrees through the pump. Pumps with less than 180 degrees or more than 360 degrees are not acceptable.

13.4 Hose and Lubricant:

Hose will be manufactured of three-layer elastomer with an inner wetted layer compatible with the process fluid, multiple layers of nylon reinforcement suitable for pressure rating of the hose, and a natural rubber outer layer. Hose must be specifically designed for peristaltic pump service.

13.4.1 Minimum static burst pressure rating of 600 psi.
13.4.2 53-68 Shore A durometer
13.4.3 Hose must be replaceable without cover or pump removal
13.4.4 Pump hose must be lubricated. Pumps with rollers shall use a food grade silicone grease. Pumps with shoes shall be filled approximately 50% with a food grade glycerin based hose lubricant to remove heat of friction and provide lubrication.
13.4.5 Pumps with shoes: Provide a threaded drain plug at the lowest point of the priming chamber to allow the complete drainage of the lubricant.
13.4.6 Pumps that do not use an internal lubricant are not acceptable.
13.4.7 Single hose per pump casing. Pumps using more than one hose per pump casing to achieve the flow are not acceptable.

13.5 Pump Housing with Internal Bearing Frame:

Pump housing will be constructed of cast iron and will be supplied with an internally mounted bearing hub and rotor assembly. Gear unit will be directly coupled to the back of the pump housing and will be completely isolated from the process fluid and pump lubricant through the sealed bearing hub. Gear unit and drive components will be serviceable without removal of the pump rotor. Pumps with aluminum housing are not acceptable.

13.6 Rotor will be constructed of cast iron ASTM A48. Shoe pumps: Rotor will be supplied with two pressing shoes mounted 180 degrees apart. Shoes will be constructed of epoxy or aluminum as recommended by the manufacturer and will be adjustable for varying degrees of compression via flat shims constructed of 316SS. Roller pumps: Rotor will be supplied with two rollers mounted 180 degrees apart. Rollers shall be anodized steel or corrosion resistant metal as recommended by the manufacturer. Each will be supplied with two(2) permanently grease lubricated ball bearings and two (2) nitrile rubber lip seals.

13.7 Bearing cartridge – Pump displacement 1.76 gal/rev or less: Pump shall be equipped with a carbon steel cartridge type bearing housing including permanently grease lubricated anti-friction ball bearings with a minimum L-10 life of 40,000 hours at maximum operating speeds. A nitrile rubber lip seal will isolate the bearings from pumped liquid in the event of a hose failure. The bearing cartridge shall accept direct coupling to a flange mounted gearbox with a keyed output shaft and will be designed to absorb the full radial load of the hose compression mechanism.

13.8 Bearing cartridge – Pump displacement larger than 1.76 gal/rev: Pump shall be equipped with a carbon steel cartridge type bearing housing including permanently grease lubricated anti-friction ball bearings with a minimum L-10 life of 40,000 hours at maximum operating speeds. A nitrile rubber lip seal will isolate the bearings from pumped liquid in the event of a hose failure. The bearing cartridge shall accept direct coupling to a flange-mounted gearbox with a splined shaft. Bearing cartridge shall be removable from the rotor side of the housing without the need to remove the pump housing or gearbox and no special tools shall be required.

13.9 Direct-coupled pump: Close-coupled pumps with the rotor mounted directly on the gearbox output shaft or long-coupled pumps with external coupling are not acceptable.

13.10 Chemical service: Pump housing and rotor shall be coated with Halar. Shoes/Rollers shall be 316SS or epoxy. All fasteners shall be 316SS.

13.11 Connectors:
Inlet and outlet connections shall be 150# ANSI raised face flanges. Flange inserts or flanges (if wetted) shall be compatible with the process fluid. Hoses should be secured with integral compression flanges (preferred) or as an alternate may be secured with automotive style clamps.

13.12 Flange supports shall be constructed of 316SS with 316SS hardware on corrosive applications.

13.13 Van Stone-type flanges shall be 316SS on corrosive applications.

13.14 Pump Cover

13.15 Roller pumps: Carbon steel cover ring with a polyester epoxy powder coating and removable one (1) piece clear polycarbonate viewing window. Window shall be sufficiently sized to allow for adjustment of shims and view rotation from the front of the pump.

13.16 Shoe pumps:
For 25mm and 32mm pumps, cover will be constructed of carbon steel or cast iron and will be fitted with a fixed window. The cover will be removable for replacement of pressing shoes or shims.

13.17 For 40mm – 100mm pumps, cover will be constructed of carbon steel with a removable clear viewing inspection window sufficiently large enough to replace pressing shoes and allow for shim replacement without removing the pump cover.

13.18 Pump cover will be sealed to the pumphead via a captive Buna-N o-ring.
13.19 Pump hardware will be stainless steel.
13.20 Aluminum construction is not acceptable.
13.21 Frame:
13.21.1 Support frame will be constructed of steel (alternate: 316SS for corrosive applications). Welded steel or modular adjustable frames are not acceptable.
13.21.2 Frame and pump construction will be such that alignment is not required for installation.
13.22 Hose leak detector:
Roller pumps. Hose leak detector shall be of the capacitance type, located at the lowest point of the pump body. Switch shall be supplied NC (optional NO) rated 24-240VAC 300mA continuous switch current. Mount the sensor on the rear of the pump housing.

13.23 Shoe pumps. Hose leak detector shall be of the capacitance type, located at the highest point of the pump body. Switch shall be supplied NC (optional NO) rated 24-240VAC 300mA continuous switch current. Mount the sensor on the rear of the pump housing. This option allows direct wiring in series with the pump motor start circuit for pump shutdown in the event of hose leak. No other interface equipment is required.

13.24 Gearing:
13.24.1 Provide gearing with direct-coupled mounting to the pump housing.
13.24.2 For 25mm to 50mm pumps. Gearbox shall be of the in-line helical design, of standard commercial manufacture with a minimum service factor of 1.4 based upon motor nameplate rating, an AGMA Class II continuous duty rating, NEMA C-face motor input, footless design with flanged connection and keyed output shaft. Integral gearmotors are not acceptable
13.24.3 Gearbox replacement units, parts and service must be available directly from local gearbox distributor. Purchase directly from Pump Vendor shall not be required.

13.25 **Motors:**

13.25.1 Provide premium efficient, TEFC squirrel cage induction motors, NEMA C-Face, conforming to the latest applicable requirements of NEMA, IEEE, ANSI and NEC standards.

13.25.2 Provide motor HP appropriate for the maximum speed and pressure conditions specified in the Process Pump Schedule.

13.25.3 Motors are to be designed for 3-phase, 230-460VAC operation, NEMA Design B with torque and starting currents in accordance with NEMA MG-1. Ratings to be based on a 40 degree C ambient 3,300 feet altitude of lower operation with a maximum temperature rise of 80 degree C at 1.0 service factor (and 90 degree C rise 1.15 S.F.)

13.25.4 Motors will be furnished with Class F insulation. Motors will have a 1.15 service factor but will be selected for operation within their full load rating without applying the service factor.

13.25.5 Bearings will provide L10 rating of 100,000 hours minimum for C-face applications. For frame sizes 56-140, bearings will be permanently lubricated. For frame sizes 180 and larger, bearings shall be re-greasable.

13.25.6 For frame sizes 180 and larger, motor construction shall be cast iron For frame sizes 56-140, carbon steel construction is acceptable.

13.25.7 External cooling fan on TEFC motors shall be corrosion resistant, non-sparking.

13.25.8 Motors shall be suitable for use with PWM type variable frequency drives with a minimum turndown rating of 3-60 Hz.

13.26 Maximum flow rate: 12 gallons per minute

13.27 WARRANTY:

The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

13.28 LITERATURE:

The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

13.29 DELIVERY:

Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than sixty (60) calendar days after receipt of a City of Houston Purchase Order.

13.30 TRAINING:

A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

14.0 ITEM NO. 12: PUMP, PERISTALTIC PUMP - PERIFLO MODEL FMP

14.1 PUMP MODEL
14.2 Pump shall be PERIFLO MODEL FMP

14.3 OPERATING CONDITIONS
14.4 Powdered Activated Carbon slurry.
14.5 PERISTALTIC PUMPS
14.6 Acceptable bidders: PERIFLO, or equal.
14.7 Pump Construction: General
- 14.7.1 Horizontal, positive displacement, peristaltic pump
- 14.7.2 Capable of operating in either direction without flow variation
- 14.7.3 Capable of running dry without damage to pump or hose
- 14.7.4 Capable of pulling 95% of full vacuum
- 14.7.5 Repeatability: 1% accurate
- 14.7.6 Valveless/Glandless with no dynamic seals in contact with the pumped product
- 14.7.7 Simplex or duplex as indicated in the Process Pump Schedule
- 14.7.8 Pump will be capable of being rotated in 90-degree increments for four (4) different port mounting configurations
- 14.7.9 Direct coupled gear arrangement. Pumps with close coupled or bare shaft arrangements are not acceptable
- 14.7.10 Angle of hose 180 degrees through the pump. Pumps with less than 180 degrees or more than 360 degrees are not acceptable.

14.8 Hose and Lubricant
- 14.8.1 Hose will be manufactured of three-layer elastomer with an inner wetted layer compatible with the process fluid, multiple layers of nylon reinforcement suitable for pressure rating of the hose, and a natural rubber outer layer. Hose must be specifically designed for peristaltic pump service.
- 14.8.2 Minimum static burst pressure rating of 600 psi.
- 14.8.3 53-68 Shore A durometer
- 14.8.4 Hose must be replaceable without cover or pump removal
- 14.8.5 Pump hose must be lubricated. Pumps with rollers shall use a food grade silicone grease. Pumps with shoes shall be filled approximately 50% with a food grade glycerin based hose lubricant to remove heat of friction and provide lubrication.
- 14.8.6 Pumps with shoes: Provide a threaded drain plug at the lowest point of the priming chamber to allow the complete drainage of the lubricant.
- 14.8.7 Pumps that do not use an internal lubricant are not acceptable.
- 14.8.8 Single hose per pump casing. Pumps using more than one hose per pump casing to achieve the flow are not acceptable.

14.9 Pump Housing with Internal Bearing Frame

Pump housing will be constructed of cast iron and will be supplied with an internally mounted bearing hub and rotor assembly. Gear unit will be directly coupled to the back of the pump housing and will be completely isolated from the process fluid and pump lubricant through the sealed bearing hub. Gear unit and drive components will be serviceable without removal of the pump rotor. Pumps with aluminum housing are not acceptable.

14.10 Rotor will be constructed of cast iron ASTM A48.

14.10.1 Shoe pumps: Rotor will be supplied with two pressing shoes mounted 180 degrees apart. Shoes will be constructed of epoxy or aluminum as recommended by the manufacturer and will be adjustable for varying degrees of compression via flat shims constructed of 316SS.

14.10.2 Roller pumps: Rotor will be supplied with two rollers mounted 180 degrees apart. Rollers shall be anodized steel or corrosion resistant metal as recommended by the manufacturer. Each will be supplied with two(2) permanently grease lubricated ball bearings and two (2) nitrile rubber lip seals.

14.11 Bearing cartridge – Pump displacement 1.76 gal/rev or less: Pump shall be equipped with a carbon steel cartridge type bearing housing including permanently grease lubricated anti-friction ball bearings with a minimum L-10 life of 40,000 hours at maximum operating speeds. A nitrile rubber lip seal will isolate the bearings from pumped liquid in the event of a hose failure. The bearing cartridge shall accept direct coupling to a flange mounted gearbox with a keyed output shaft and will be designed to absorb the full radial load of the hose compression mechanism.

14.12 Bearing cartridge – Pump displacement larger than 1.76 gal/rev: Pump shall be equipped with a carbon steel cartridge type bearing housing including permanently grease lubricated anti-friction ball bearings with a minimum L-10 life of 40,000 hours at maximum operating speeds. A nitrile rubber lip seal will isolate the bearings from pumped liquid in the event of a hose failure. The bearing cartridge shall accept direct coupling to a flange-mounted gearbox with a splined shaft. Bearing cartridge shall be removable from the rotor side of the housing without the need to remove the pump housing or gearbox and no special tools shall be required.

14.13 Direct-coupled pump: Close-coupled pumps with the rotor mounted directly on the gearbox output shaft or long-coupled pumps with external coupling are not acceptable.

14.14 Chemical service: Pump housing and rotor shall be coated with Halar. Shoes/Rollers shall be 316SS or epoxy. All fasteners shall be 316SS.

14.15 Connectors

Inlet and outlet connections shall be 150# ANSI raised face flanges. Flange inserts or flanges (if wetted) shall be compatible with the process fluid. Hoses should be secured with integral compression flanges (preferred) or as an alternate may be secured with automotive style clamps.

14.15.1 Flange supports shall be constructed of 316SS with 316SS hardware on corrosive applications.

14.15.2 Van Stone-type flanges shall be 316SS on corrosive applications.

14.16 Pump Cover

14.16.1 Roller pumps: Carbon steel cover ring with a polyester epoxy powder coating and removable one (1) piece clear polycarbonate viewing window. Window shall be sufficiently sized to allow for adjustment of shims and view rotation from the front of the pump.

14.16.2 Shoe pumps:

14.16.3 For 25mm and 32mm pumps, cover will be constructed of carbon steel or cast iron and will be fitted with a fixed window. The cover will be removable for replacement of pressing shoes or shims.

14.16.4 For 40mm – 100mm pumps, cover will be constructed of carbon steel with a removable clear viewing inspection window sufficiently large enough to replace pressing shoes and allow for shim replacement without removing the pump cover.

14.16.5 Pump cover will be sealed to the pumphead via a captive Buna-N o-ring.

14.16.6 Pump hardware will be stainless steel.

14.16.7 Aluminum construction is not acceptable.

14.17 Frame

14.17.1 Support frame will be constructed of steel (alternate: 316SS for corrosive applications). Welded steel or modular adjustable frames are not acceptable.

14.17.2 Frame and pump construction will be such that alignment is not required for installation.

14.18 Hose leak detector

14.18.1 Roller pumps. Hose leak detector shall be of the capacitance type, located at the lowest point of the pump body. Switch shall be supplied NC (optional NO) rated 24-240VAC 300mA continuous switch current. Mount the sensor on the rear of the pump housing.

14.18.2 Shoe pumps. Hose leak detector shall be of the capacitance type, located at the highest point of the pump body. Switch shall be supplied NC (optional NO) rated 24-240VAC 300mA continuous switch current. Mount the sensor on the rear of the pump housing. This option allows direct wiring in series with the pump motor start circuit for pump shutdown in the event of hose leak. No other interface equipment is required.

14.19 Gearing:

14.19.1 Provide gearing with direct-coupled mounting to the pump housing.

14.19.2 For 25mm to 50mm pumps. Gearbox shall be of the in-line helical design, of standard commercial manufacture with a minimum service factor of 1.4 based upon motor nameplate rating, an AGMA Class II continuous duty rating, NEMA C-face motor input, footless design with flanged connection and keyed output shaft. Integral gearmotors are not acceptable

14.19.3 Gearbox replacement units, parts and service must be available directly from local gearbox distributor. Purchase directly from Pump Vendor shall not be required.

14.20 **Motors:**

14.20.1 Provide premium efficient, TEFC squirrel cage induction motors, NEMA C-Face, conforming to the latest applicable requirements of NEMA, IEEE, ANSI and NEC standards.

14.20.2 Provide motor HP appropriate for the maximum speed and pressure conditions specified in the Process Pump Schedule.

14.20.3 Motors are to be designed for 3-phase, 230-460VAC operation, NEMA Design B with torque and starting currents in accordance with NEMA MG-1. Ratings to be based on a 40 degree C ambient 3,300 feet altitude of lower operation with a maximum temperature rise of 80 degree C at 1.0 service factor (and 90 degree C rise 1.15 S.F.)

14.20.4 Motors will be furnished with Class F insulation. Motors will have a 1.15 service factor but will be selected for operation within their full load rating without applying the service factor.

14.20.5 Bearings will provide L10 rating of 100,000 hours minimum for C-face applications. For frame sizes 56-140, bearings will be permanently lubricated. For frame sizes 180 and larger, bearings shall be re-greasable.

14.20.6 For frame sizes 180 and larger, motor construction shall be cast iron For frame sizes 56-140, carbon steel construction is acceptable.

14.20.7 External cooling fan on TEFC motors shall be corrosion resistant, non-sparking.

14.20.8 Motors shall be suitable for use with PWM type variable frequency drives with a minimum turndown rating of 3-60 Hz.

14.21 Maximum flow rate: 12 gallons per minute

14.22 WARRANTY:

The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

14.23 LITERATURE:

The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

14.24 DELIVERY:

Unit(s) as specified above, with delivery ticket and other documents and manuals, if requested shall be delivered to the location (s) as stated on each individual purchase order as expeditiously as possible, but no later than sixty (60) calendar days after receipt of a City of Houston Purchase Order.

14.25 TRAINING:

A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.

15.0 ITEM NO. 13: PUMP, HORIZONTAL FYBERGLASS - 3" X 4" X 10 FYBROC MODEL 1500

15.1 GENERAL:
FYBROC – recommended unit(s)

15.2 1.2 Pump shall be rated as a corrosive duty unit i.e. capable of handling water, with sodium hydroxide and sodium hypochlorite in dilute solution.

15.3 1.3 Pump shall be horizontally mounted

15.4 1.4 Pump to be installed by Vendor

15.5 Pump
2.1 Flow capacity rating shall be 250 gpm with motor speed of 1750 rpm

15.6 Discharge head rating shall be 60 ft.

15.7 Suction 4" diameter and Discharge 3" diameter

15.8 Housing Construction shall be fiber reinforced plastic with Teflon lining

15.9 Shaft shall be constructed of 316 Stainless Steel

15.10 Mechanical seals with external water flush

15.11 Conform to ANSI/ASME B73.1 Standards

15.12 WARRANTY:
The supplier shall provide a full one-year warranty on the pump, which includes parts and labor. The warranty work shall be conducted within 3 working days after receipt of written notice from the City. All shipping charges for warranty work that is required outside of the Houston area will be borne by the supplier.

15.13 LITERATURE:
The supplier shall provide two sets of operation, maintenance and parts manuals for each pump and hydraulic unit at the time of delivery.

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A minimum of four- (4) hours of training shall be conducted by the successful bidder. All training will be conducted at a City of Houston location to be determined at a later date.